App No.: 10/808,267 Docket No.: 84655-US1 Inventor: Jonathon M Schuler et al. Title: Algorithmic technique for increasing the spatial acuity of a focal plane array, etc. REPLACEMENT SHEET -209-210-211 Estimate pixel displacements of Image Sequence relative to ROI Construct composite image out of Restore the composite image pixels from Image Sequence FIG. 2 Load Recorded 201 Select Frames of Video Data to Select the Desired UpSampling (ROI) of the Reference Frame Select a Reference Frame of create an Image Sequence Select a Region of Interest Data Launch Program the Image Sequence factor of the ROI Initialize Camera Dithered motion Sequence with Record Video

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focal plane array, etc. REPLACEMENT SHEET

unction [shift] = grad\_est(ref,tgt);

ef = double(ref); gt = double(tgt); 50000 = (ref(2:end-1,1:end-1)); 5100 = (ref(2:end-0,1:end-1)); 5010 = (ref(1:end-1,2:end-0)); 5110 = (ref(2:end-0,2:end-0)); 5001 = (tgt(2:end-1,1:end-1)); 5101 = (tgt(2:end-0,1:end-1));

```
PRIOR ART
                                             dSdx1 = (S100-S000+S110-S010+S101-S001+S111-S011)/4;
                                                                      dSdx2 = (S010-S000+S110-S100+S011-S001+S111-S101)/4;
                                                                                             3Sdx3 = (S001-S000+S101-S100+S011-S010+S111-S110)/4;
S111 = (tgt(2:end-0,2:end-0));
                                                                                                                                                                                                                                                                                                                                                                                                    B = -[sum(ac(:)) sum(bc(:))];
                                                                                                                                                                                                                                                  ab = dSdx1.*dSdx2:
                                                                                                                                                                                                                                                                                                                                                  ac = dSdx1.*dSdx3;
                                                                                                                                                                                                                                                                                                                                                                           bc = dSdx2.*dSdx3;
                                                                                                                                               aa = dSdx1.^{\Lambda}2:
                                                                                                                                                                                                  bb = dSdx2.^{2}:
                                                                                                                                                                                                                           d = sum(ab(:));
                                                                                                                                                                         a = sum(aa(:));
                                                                                                                                                                                                                                                                                                    A = [a d; d b];
                                                                                                                                                                                                                                                                                                                                                                                                                                                    shift = A \ B;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              shift = shift';
                                                                                                                                                                                                                                                                                                                           %
```